

Snow cover in the Alps will halve without climate action - rapid emissions cuts would save 80% of current snow days.

The number of days of snow cover in the Alps could halve by the end of the century due to higher temperatures if greenhouse gas emissions remain high, with serious impacts on water availability, nature, and ski resorts, according to a study published in the journal *Hydrology and Earth Sciences*. The study found that with rapid climate action, 83% of current snow days would be saved.

Without emissions cuts, the loss of snow would be particularly severe in the southern Alps, such as in Italy, Slovenia, and parts of France, with the south-west Alps especially badly hit.

Lead author of the study Dr. Michael Matiu, from Eurac Research in Italy, said “I expected reductions in snow cover, but the changes found by this paper under a strong warming scenario - 4-5°C - are very high. On the other hand, there is a large margin of potential savings, if warming is limited within the Paris Agreement - which raises hope.”

This loss of snow would have serious implications for areas downstream that rely on the annual spring and summer snow melt for water.

“Snow loss will lead to a temporal shift in water availability, with higher water flows in winter and less in summer. This is particularly challenging in areas which already fight for water usage,” said Dr Matiu. “In any case, the Alps - or the countries/regions sharing the Alps - will need to find a way to manage water availability across regions and sectors, to have enough water for agriculture, energy production, domestic use, tourism, at the right time and in the right location.”

Dr. Martina Barandun, a glaciologist at EURAC Italy who was not involved in this study, said “Changing snow cover patterns will affect the timing and amount of water released and affect irrigation practices... Coming from a farming background, I know the immense stress and pressure this exerts on the small farmers in mountain regions.”

The scientists found that the number of snow days lost would vary with altitude. Mountains at 2,500m, for example, would lose 76 days - almost three months - worth of snow per year if emissions are high. If emissions are cut in line with the Paris Agreement, and global warming is constrained to 1.5-2°C, just 26 days - less than one month - would be lost. At 500m, snow days could be almost quartered. 14 days would be lost if emissions are high, leaving just five days of snow per year. Cutting emissions could save ten snow days.

Dr Matiu said that while skiing would potentially be able to continue in places due to snow making machines, “skiing resorts will have to defend the high energy and water usage - especially in times of water scarcity.” But temperatures in the mountains could get too high to produce enough artificial snow before the start of the season - although the researchers did not look at this specifically.

The increased months when snow melts to reveal bare rock or grass could itself further increase warming. White snow reflects heat, cooling the Earth, while darker rocks and vegetation absorb it, further increasing warming. The warming temperatures in the mountains would also threaten the Alps’ iconic biodiversity, from beautiful Alpine flowers to much-loved species such as ibex and marmots. Warming the Alps will change them irrevocably - staying within the Paris Agreement targets is, says Dr Matiu “vital.”

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